

Workshop 5 - Emergency Gate Operation: Induced Surcharge

Introduction

Flood events large enough to overwhelm the reservoir flood pool require an operation strategy referred to as Emergency Gate Operation, which follows the Induced Surcharge procedure. This workshop will introduce the use of ResSim's Induced Surcharge rule in Crazy Mountain reservoir. In order to make this operation possible, it would be necessary to lower the reservoir spillway 10 feet and install radial gates. Investigating the potential for Emergency Gate Operation at this reservoir, we will make these changes to the network for this workshop.

Tasks

1. Open the watershed and create a new network
 - Open the 5th workshop watershed, **WS5_Start**
 - Open Network **01 Standard**, and Save As **02 Surcharge Rule**

2. Lower the spillway and make it gated
 - Open the Reservoir Editor, and select the Physical tab
 - Add a controlled outlet to the dam
 - Change the name to **Controlled Spillway**, and add the data from the Excel spreadsheet **c:\class\CrazyMountainData.xls, tab WS#5 Emergency Gate Ops**. (Hint: Don't hand type in the data. Use copy from excel and paste in ResSim. The table will auto-expand as needed for the pasted data.)
 - Delete the uncontrolled outlet

3. Create a new operations set and make necessary changes
 - Go to the Reservoir Editor's Operations tab
 - Duplicate the operation set **Regulation Plan**, and name the new one **Surcharge Plan**
 - Change the elevation of the Major Flood zone from 712' to 718'. (Note: the top of the dam is at 743', so this is a minor change.)

4. Create a new alternative using the new network
 - Create a new alternative named **Alt 03** with description **Emergency Gate Operations**, using the new network **02 Surcharge Rule**
 - Set Time Step to **1 Hour**, Flow Computation Method to **Instantaneous**
 - Specify the new operations set, **Surcharge Plan**
 - Use the following starting conditions:

lookback elevation	700 ft
lookback storage	computed
lookback release on controlled outlet	500 cfs
lookback release on controlled spillway	0
 - Refer back to Alt 02 for the DSS pathnames needed, but for Crazy Mountain Reservoir inflow, use the record with F-part SURCHARGE. (Hint: Once the filename has been open in DSS-VUE, use the drop-down menu next to "F:" to filter all records for SURCHARGE.)
 - Don't forget to save the alternative and the network!

5. Add alternative to simulation and run
 - Go to the Simulation Module, and open the only simulation listed

- Open the Simulation Editor, and check the box for the new alternative **Alt 03**.
- Check the box for Run New Extract, and click OK
- Set **Alt 03** as the active alternative (Hint: right click on the Alt 03 listing in the Simulation Control on the right side of the GUI, and select Set As Active)
- Compute the simulation, and view the reservoir plot and the release decision report.

Questions

I) What is the resulting release pattern? What is the maximum release? What is the maximum elevation?

II) Is this operation reasonable? Why or why not?

III) What would a better operational solution look like?

- Before moving on, feel free to adjust the existing operating rules and observe the results. Please note any changes you made to the existing rules that improved the operation.

required to recede from Q_A to Q_B . This is time T_s . $T_s =$ _____

- Create a new trial
 - In the Simulation Control panel, right-click on the Alt 03 alternative and select **New Trial...**
 - Name it **IS rule**
 - Ensure that it is **bold** and the active alternative
- Add Induced Surcharge Rule
 - Go to the Reservoir Editor's Operations tab, and remove the rules from the Major Flood Zone
 - Add an Induced Surcharge Rule to the Major Flood zone. (Note: Induced Surcharge Rule must be added to the reservoir itself, not the dam or the outlet.)
 - Use the envelope curve read from the Emergency Spillway Release Diagram, and the recession constant T_s computed above.
 - Click the button for Falling Pool options and use time for pool decrease = **4 hours**, a transition elevation of **702 ft**, and the third release option of "Maintain Peak Release."
 - Note: It is important for the Induced Surcharge Rule to be included in any zone for which it is relevant.

Questions

VII) Examine the Emergency Spillway Release Diagram. In which zones is the rule needed?

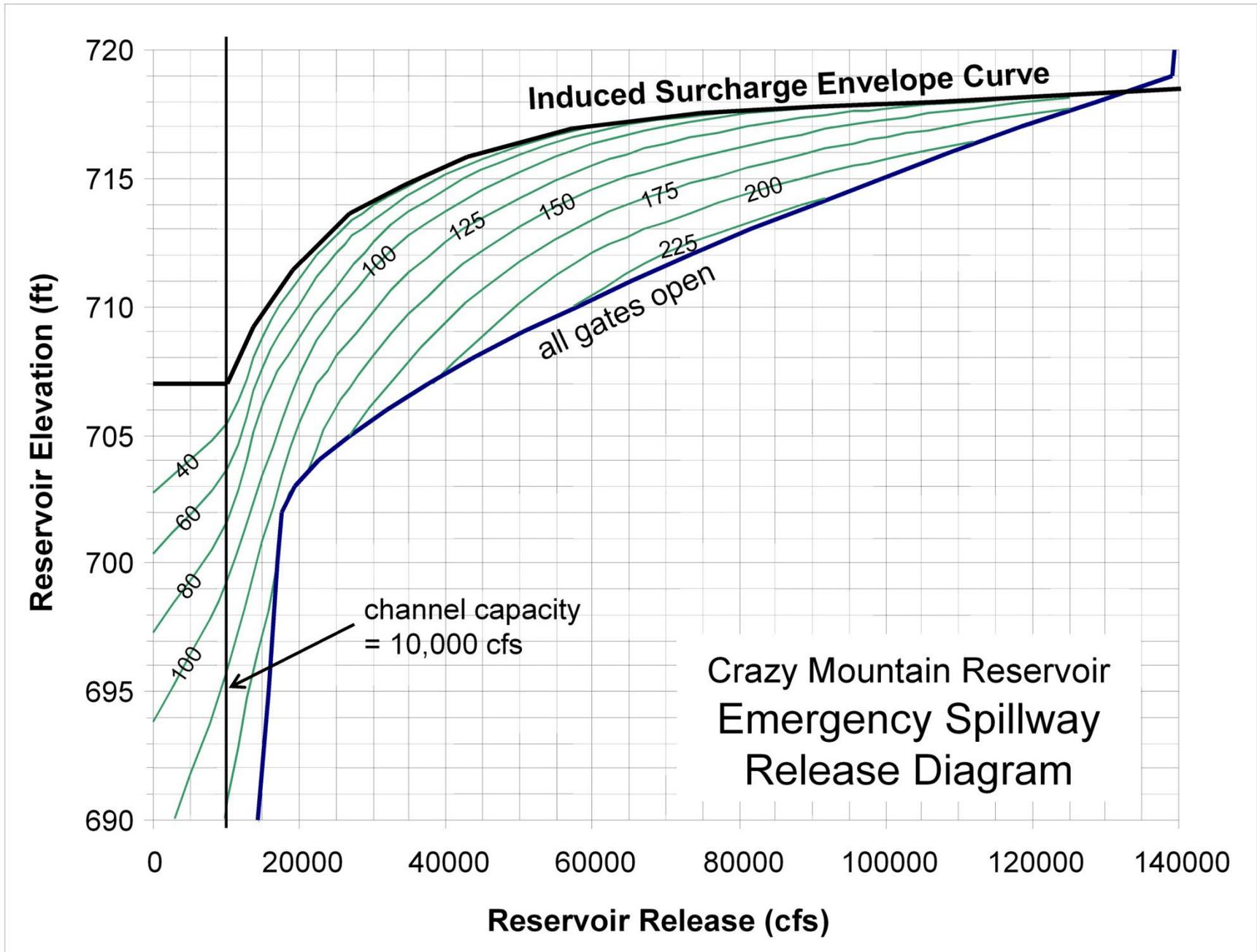
- Add the IS rule to the necessary zones. Make sure this rule has the highest priority!
- Use of the Induced Surcharge rule requires a maximum release rule in the same zone. Place the **Max Rel – Dam** rule into the Major Flood zone using the Use Existing Rule option.
- Compute the trial, plot the results, and view the release decision report.

Questions

VIII) Is the simulation any different when the surcharge rule is used? How and why?

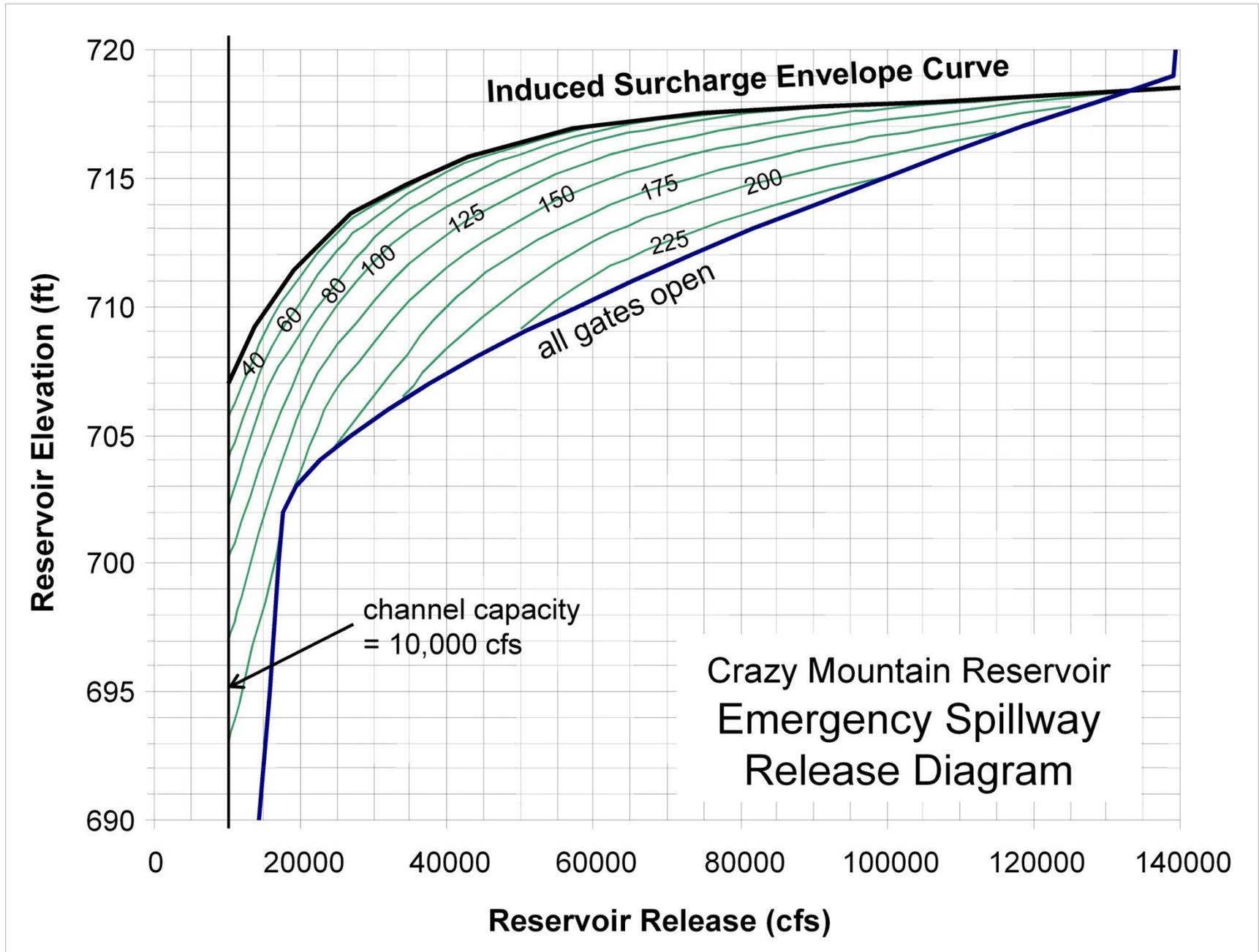
IX) What is the maximum release? What is the maximum elevation?

Figure 1a, Emergency Spillway Release Diagram



Crazy Mountain Reservoir
Emergency Spillway
Release Diagram

Figure 1b, Emergency Spillway Release Diagram



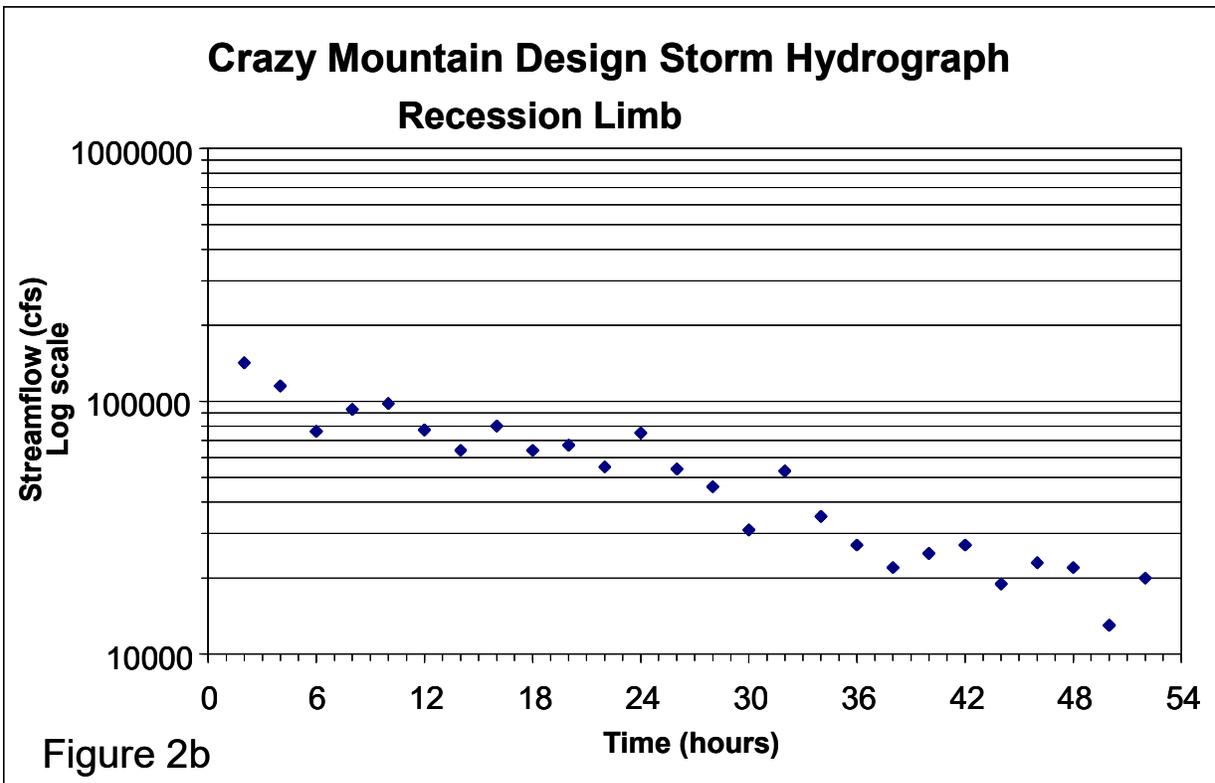
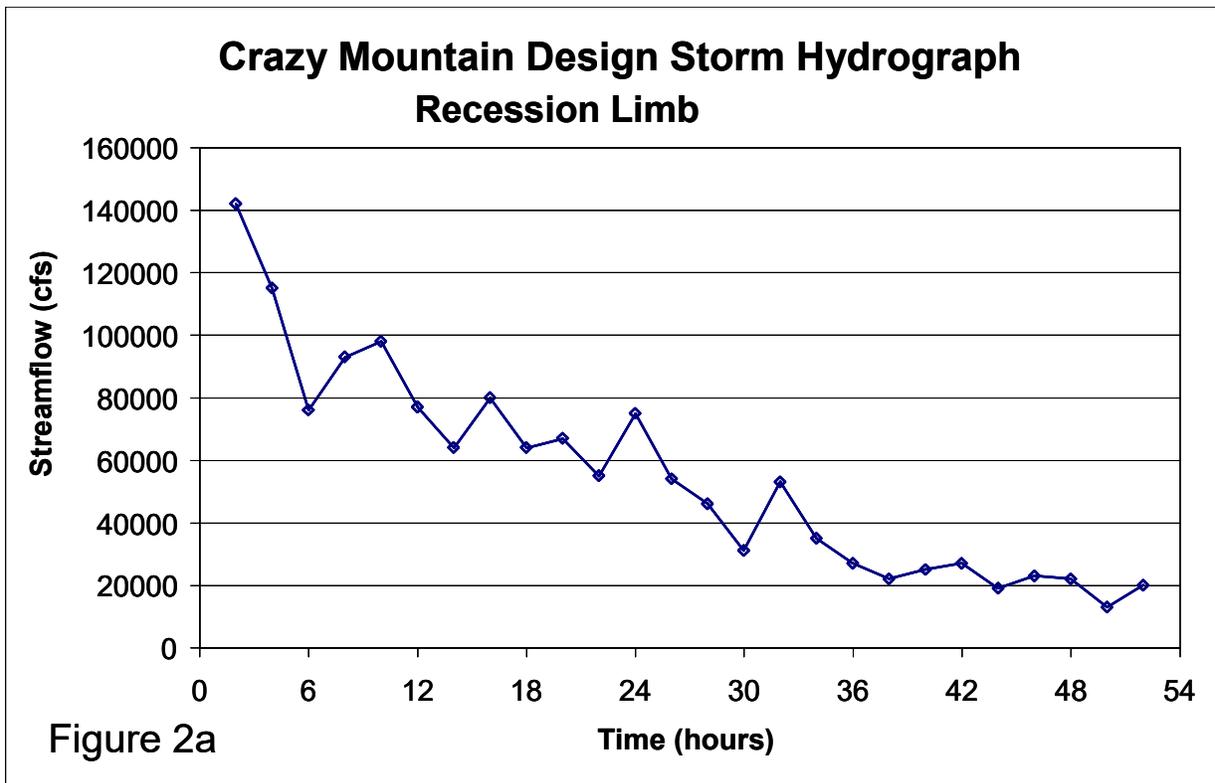


Figure 2, Recession Limb